UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,880	03/15/2004	Dingjun Wu	06457 USA	1949

23543 7590 01/19/2007

AIR PRODUCTS AND CHEMICALS, INC.
PATENT DEPARTMENT
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 181951501

EXAMINER	
STOUFFER, KELLY M	
ART UNIT	**PAPER NUMBER**
1762	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/800,880	WU ET AL.	
	Examiner	Art Unit	
	Kelly Stouffer	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. In view of the amendments to the specification filed 21 December 2006, the objection of the specification has been withdrawn.

2. Applicant's arguments, filed 21 December 2006, with respect to the 35 USC 112 rejections of claims 2-7 and 9-15 have been fully considered and are persuasive. The 35 USC 112 rejections of claims 2-7 and 9-15 have been withdrawn.

3. Applicant's arguments filed 21 December 2006 with respect to the 35 USC 103(a) rejections of the claims have been fully considered but they are not persuasive. The applicant argues that Sandhu et al. and Giolando are not combinable to reject claims 1-4, 12 and 14-15 because they do not teach cleaning titanium oxide deposits from a reactor. The language of claim 1, however, suggests that the cleaning process is for a reactor used to deposit titanium oxide, not for a reactor whose surfaces are covered in titanium oxide. Therefore, cleaning the residue of a precursor from the surface of a chamber that is used to deposit titanium oxide reads on this claim. The surface in the chamber that would be covered with titanium oxide would be the substrate, and one of ordinary skill in the art would recognize that some titanium oxide may be deposited on the chamber surfaces by this method and would also be cleaned off.

Therefore, the rejections of the previous office action are maintained and are repeated here in their entirety. In addition, new grounds of rejection are present for claims 16-20 that were added in the amendment filed on 21 December 2006.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-4, 12 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent number 6554910 to Sandhu et al. in view of US Patent publication 2002/0071912 to Giolando.

Regarding claim 1, Sandhu et al. discloses a process used to clean a reactor used to coat substrates with titanium oxide combinations using metal source gases such as $TiCl_4$ (column 1 lines 8-14, 22-40) that leave contaminant deposits on chamber walls that need cleaned off after deposition (columns 1-2 lines 41-14). The reactor to be cleaned contains a chamber comprising a surface at least partially coated with the metal residue (column 2 lines 33-40). A reactive gas, or treatment gas, is added to the chamber with a cleaning agent to interact with the residue to forma removable treatment product, (column 2 lines 33-40) which one of ordinary skill in the art would recognize as being volatile because this process takes place without opening the chamber and it would not be able to be removed otherwise. Sandhu et al. implies that the $TiCl_4$ may be used to form titanium oxide during a CVD process on a surface, but does not explicitly state this. Giolando teaches a using $TiCl_4$ during a CVD process to deposit titanium oxide as a procedure well known in the art that leaves $TiCl_4$ deposits on the chamber surface (paragraph 0004 et seq.). One would want to use $TiCl_4$ to deposit metal source materials for semiconductor applications (Sandhu et al. column 1 et seq.).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sandhu et al. to explicitly state that the $TiCl_4$ is used to deposit titanium oxide as taught by Giolando in order to use a precursor well-known in the art to deposit metal source materials for semiconductor applications.

With regard to claims 2-4 and 16-18, Sandhu et al. discloses the cleaning gas as chlorine (Cl_2) or chlorine containing cleaning gases in column 5 lines 1-3.

Regarding claim 12, Sandhu et al. discloses an opening in the chamber 22 in Figure 1 that is for introducing the cleaning gas. It is obvious to one of ordinary skill in the art that such a cleaning gas (chlorine as used by Sandhu et al.) must come from a gas cylinder with a safe delivery system, otherwise the gas would escape to the atmosphere and would be poisonous.

With regard to claim 14, Giolando discloses the article receiving the titanium oxide film to be a glass substrate, or work piece at least as broadly recited by claim 14.

Regarding claim 15, Sandu et al. in view of Giolando et al. include all of the provisions of claim 15, as described above.

5. Claims 5-7, 9-10, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu et al. in view of Giolando as applied above, and further in view of US Patent number 6635569 to Ameen et al. Sandhu et al. in view of Giolando is applied above but does not include a fluorine-containing gas as a precursor, but does include provisions for plasma in column 6 lines 10-12. Ameen et al. teaches the removal of $TiCl_x$ precursors on a chamber walls using NF_3 (as required by claims 5-7) or

Cl_2 (as taught by Sandhu et al.) as an in situ plasma (as required by claims 9-10) in column 9 lines 1-5. The fluorine-containing gas of Ameen et al. may be used with a reasonable expectation of success with the combined method of Sandhu et al. and Giolando in order to provide alternative cleaning gases (as implied by the document of Ameen et al. to clean deposited $TiCl_4$ precursors from reactor surfaces (column 9 lines 1-5).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sandhu et al. and Giolando to include fluorine containing gases as cleaning gases as taught by Ameen et al. to clean deposited $TiCl_4$ precursors from reactor surfaces.

6. Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu et al. in view of Giolando as applied above, and further in view of Ameen et al. and US Patent number 5788778 to Shang et al. Sandhu et al. in view of Giolando and in further view of Ameen et al. is described above, but does not include the plasma generated from the cleaning gas as remote plasma. Shang et al. teaches using a remote plasma source to generate a cleaning plasma for cleaning the inside of a chamber (column 2 lines 34-56) because it is more efficient than using an in situ plasma source (column 1 lines 38-42). The remote plasma generator 46 of Shang et al. where the cleaning gas can said to be formed is in close proximity to the deposition chamber 10 as required by claim 13, at least as broadly recited by the claim.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sandhu et al., Giolando, and Shang et al. to include a remote plasma source for generating the cleaning plasma as taught by Shang et al. in order to perform a more efficient cleaning process.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sandhu et al. in view of Giolando as applied above, and further in view of Shang et al. Sandhu et al. and Giolando are described above and include all of the provisions of claim 8 except having an inert gas included in the cleaning gas. Shang et al. teaches including an inert gas in a cleaning gas to assist in the cleaning process or help initiate a cleaning plasma in a deposition chamber (column 5 lines 1-8).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sandhu et al. and Giolando to include an inert carrier gas with the cleaning gas as taught by Shang et al. in order to assist in the cleaning process or help initiate a cleaning plasma in a deposition chamber.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER